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ABSTRACT

A progress report on an experiment begun in 1968, originally entitled "Experimental Variation of Head Start Curricula: A Comparison of Current Approaches," is given. Children were taught by one of four methods in Head Start at age of four years. In Kindergarten and first-grade years most had either Follow Through or Regular programs. Monitoring of classrooms was done through first-grade year. Results show Head Start program differences on Binet IQ obtained in prekindergarten year had disappeared by end of first grade, following steady decline for all groups. Experimental Head Starts were equal to city median and superior to similar (Title I) schools. (NF)

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"FOUR PRESCHOOL PROGRAMS: THEIR DIMENSIONS AND EFFECTS"

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June 1, 1971 - May 31, 1972

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FOUR PRESCHOOL PROGRAMS: THEIR DIMENSIONS AND EFFECTS

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First-Grade Year

This is the 10th Progress Report on a longitudinal experiment begun in 1968 and originally entitled "Experimental Variation of Head Start Curricula: A Comparison of Current Approaches". The study was initially funded by the Office of Economic Opportunity and is currently being supported by the Department of Health, Education, and Welfare--Public Health Service. The children were taught by one of four methods in Head Start at the age of four years--Bereiter-Engelmann (B-E), DARCEE, Montessori, or Traditional. In their kindergarten and first-grade years most of them had either Follow Through or Regular programs. Monitoring of classrooms was done through the first-grade year. Testing of children at the end of second grade will complete the study.

This report covers the period from June 1, 1971 to May 31, 1972 and presents the results of monitoring of first-grade video-tapes, the main battery of tests given by the research staff at the end of the first grade, and the California Achievement Test given by the city schools at the end of first grade.

During the 1970-71 school year, video-tapes were made on 27 Regular first-grade teachers and five Follow Through teachers. Of the Regular teachers, two tapes were obtained on six teachers and one tape was obtained on the remaining 21. Two tapes were obtained on each of the Follow Through teachers.

In April and May of 1971, 289 children were retested with those tests of the original battery which were still appropriate. The following tests were administered: Stanford-Binet, Replacement Puzzle, Curiosity Box, Dog and Bone, Basic Concept Inventory, Wepman Auditory Discrimination Test, Face Sheet of the Binet, Parallel Sentence Production, and Gumpgookies. Middle-class children were tested at the end of their kindergarten year with the following tests: Stanford-Binet, Replacement Puzzle, Curiosity Box, Dog and Bone, Basic Concept Inventory, Wepman Auditory Discrimination Test, Children's Auditory Discrimination Inventory, Face Sheet of the Binet, Parallel Sentence Production, Preschool Inventory, and Arithmetic. Procedural controls were similar to those in previous years.

During this same period all first-grade children were given the California Achievement Test, Level 1, by the city schools. Raw scores and grade equivalents were obtained for each child. Results of these tests are presented separately because the problems of analysis and interpretation are in some respects different from those involved in repeated tests.

Results

A. Program Characteristics

No statistical comparisons from video-tape data have been made at this point, but some results were obvious, and consistent with previous findings. Follow Through first-grade classrooms were distinguished primarily from Regular classrooms in that Follow Through teachers interacted with Individual children rather than with Groups of children. These results are similar to results found in kindergarten classes. In general, Regular first-grade teachers interacted with both Groups and Individuals, except on Negative KOR where they interacted with Individuals, and in Giving Information where they tended to interact with the Group. Modeling as a technique was quite common in Follow Through classrooms. It did not appear that there were strong differences between Follow Through and Regular in terms of total amount of Academic Requests or total amount of Academic Information that was given to the children. However, Positive Feedback was slightly higher in the Follow Through classrooms.

B. Program Effects

Analyses (Main Battery)

With regard to results on the main test battery, there were a number of questions of interest. Of primary importance was the nature of the effects of the four Head Start programs, apart from and in combination with the two types of subsequent experience in kindergarten and first grade. Sex differences were also of interest and it was important to determine whether there would be stability of trends noted at the end of kindergarten.

In order to answer these various questions, a number of different analyses were necessary. Some analyses were made, not to obtain additional information, but primarily to guard against erroneous interpretations. For example, a main effect of Head Start program obtained from an analysis which excluded the variable of Follow Through or Regular Kindergarten and first grade might mean several things: (1) it could represent a powerful effect at one time period; (2) it could represent a strong effect in the Regular program which was not paralleled in Follow Through but emerged significant because of the larger number of subjects in Regular; or (3) it could result from an effect which was characteristic of both Follow Through and Regular.

The rationale for answering questions about the interaction and covariation of Head Start with the two sequences (Follow Through and Regular) was essentially the same as it was at the end of kindergarten. During first grade, however, although attrition was not large, there were a number of transfers from Regular to Follow Through and vice versa. This created a larger number of different sequences and reduced the numbers in specified sub-groups, particularly those who had two years of Follow Through (FF). For this reason no separate analyses were made within FF. Within the sequence of Regular Kinder-

garten and Regular First Grade (RR), there were at least two classes from each Head Start program, except Montessori. Further, these children had been distributed among a large number of classes and schools. Therefore, their kindergarten and first-grade experiences could be considered typical within the limits of the variations present among regular school programs in the community.

In order to obtain information about sex, trends over time, and the interaction of various programs with these two variables, an analysis of variance over all four data points was made using the four Head Start programs and the original Controls (CL₁) but combining over all later sequences. Thus, the analysis of variance was a $5 \times 2 \times 4$ factorial with repeated measures on the last factor, using 5 groups, 2 sexes, and 4 time periods. Analysis of just the first-grade data point was a 5×2 factorial analysis of variance using the two factors of Head Start groups and sex. N for both analyses was 221.

To investigate the effects of Head Start versus no Head Start interacting with the FF-RR sequences over time, these three factors were included in a $2 \times 2 \times 2$ factorial analysis of variance (Head Start vs. no Head Start, FF-RR, and time periods: Kindergarten and first grade) with repeated measures on the last factor. The four types of Head Start were combined in both FF and RR. In addition, an analysis of variance which included each Head Start program and Controls, the FF-RR sequence, and time (kindergarten and first grade) was made. This analysis was a $5 \times 2 \times 2$ factorial with time being a repeated measures factor, and was used primarily to check on results which might be misleading because of possible interactions of Head Start/kindergarten/first-grade programs. Both the original Controls (CL₁) and the Follow Through Control group (CL₂) were included in these two analyses. N for both analyses was 165.

A repeated measures analysis within RR was made which included Head Start programs and CL₁ and sex ($5 \times 2 \times 2$). This analysis was made over two data points--kindergarten and first grade, and N was 114.

Since the method of handling the Achievement Test data was necessarily different, these analyses are discussed and results presented separately (p. 15).

Results on all measures are presented only for those variables on which effects were statistically significant at the .05 level of confidence.

Results (Main Battery)

Means for Head Start and Control groups (CL₁) combined over both FF and RR for the four data points are shown in Table 1. Means for the five groups in each sequence separately at the kindergarten and first-grade points are shown in Table 2.

(1) Head Start Program Stability

On the Stanford-Binet, for all groups combined, there was an increase in the Head Start year, followed by a decrease in both the kindergarten and first-grade years. The first-grade IQ level was about the same as the level at the beginning of Head Start. Mean IQs for each of the five groups at the four data points are shown in Figure 1. Controls did not change during the prekindergarten year, but increased in kindergarten. Head Start children increased in the prekindergarten year, then decreased in kindergarten. Of particular interest is the performance of the B-E children, increasing in Head Start and decreasing in both kindergarten and first grade at a faster rate than the other groups, so at the end of first grade, they were the lowest group on intelligence and below their initial level. This was primarily due to their greater decrease in RR in comparison to the decrease in other Head Start groups.

On the Basic Concept Inventory (BCI) and the Parallel Sentence Production (PSP), all groups improved from kindergarten to first grade.

The previous finding of a significant difference on the Dog and Bone between the two highest (DARCEE and Montessori) and the two lowest (B-E and Traditional) groups was confirmed by the analysis over four data points. Means at the four points are shown in Figure 2. Program order was similar within RR, with DARCEE highest at the end of first grade. From kindergarten to first grade, one group--Montessori children--declined.

Performance on Curiosity-Activity was constant through Head Start and kindergarten, then increased at first grade. A main effect of Head Start program confirmed previous results showing the continued low position of Traditional on this measure. This result was confirmed within RR. Means at kindergarten and first grade are shown in Figure 3. Within RR, DARCEE was high on Curiosity-Verbal with more than twice as much verbalization as the next highest group (Controls).

On the Behavior Inventory, there were a number of Head Start program differences. B-E and Montessori children became more aggressive during first grade; B-E was the only group who increased in aggression in both kindergarten and first grade, becoming significantly more aggressive than Montessori and

TABLE 1

Main Test Battery: Pre-Kindergarten, Kindergarten, and First Grade
Means for Head Start Programs and Controls (CL₁)

	B-E (N=59)	DARCEE (N=57)	Montessori (N=32)	Traditional (N=44)	Controls (N=29)
<u>Stanford-Binet</u>					
Pre-Kind. Fall	92.98	95.47	91.67	89.88	89.06
Pre-Kind. Spring	98.81	96.81	96.45	96.31	90.27
Kindergarten	94.10	95.00	94.51	94.18	94.06
1st Grade	89.96	93.81	94.29	93.09	92.48
<u>Dog and Bone</u>					
Pre-Kind. Fall	3.31	3.49	4.15	2.79	4.41
Pre-Kind. Spring	4.41	6.14	5.71	3.97	5.51
Kindergarten	6.48	8.24	9.40	6.61	7.41
1st Grade	7.10	9.05	8.09	7.84	8.89
<u>Replacement Puzzle A</u>					
Pre-Kind. Fall	21.52	20.37	19.60	21.00	17.68
Pre-Kind. Spring	22.31	22.62	22.00	22.52	21.17
Kindergarten	23.85	23.60	23.07	23.45	23.68
1st Grade	23.91	23.64	23.17	23.11	23.72
<u>Replacement Puzzle B</u>					
Pre-Kind. Fall	10.17	8.16	9.53	9.06	8.13
Pre-Kind. Spring	9.78	9.73	7.35	9.18	7.24
Kindergarten	13.08	11.58	11.71	12.79	10.89
1st Grade	10.96	10.69	11.75	10.43	12.65
<u>Curiosity-Verbal</u>					
Pre-Kind. Fall	1.81	1.84	1.03	1.31	2.58
Pre-Kind. Spring	.84	1.77	1.12	.93	.93
Kindergarten	.98	1.70	.62	1.09	1.06
1st Grade	.61	2.08	1.53	1.15	1.79
<u>Curiosity-Activity</u>					
Pre-Kind. Fall	15.83	14.78	17.65	13.93	15.44
Pre-Kind. Spring	16.77	16.07	17.28	14.56	10.82
Kindergarten	15.66	15.82	17.43	12.90	15.96
1st Grade	18.18	18.10	17.18	15.45	16.79
<u>PSP</u>					
Pre-Kind. Fall	-	-	-	-	-
Pre-Kind. Spring	-	-	-	-	-
Kindergarten	103.22	104.00	105.78	100.70	97.79
1st Grade	120.24	118.24	121.37	120.11	120.72

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TABLE 1 continued

	B-E	DARCEE	Montessori	Traditional	Controls
<u>BCI</u>					
Pre-Kind. Fall	-	-	-	-	-
Pre-Kind. Spring	-	-	-	-	-
Kindergarten	33.15	33.68	32.48	36.30	36.48
1st Grade	27.59	27.57	25.61	28.18	28.82
<u>Behavior Inventory</u>					
<u>Independence</u>					
Pre-Kind. Fall	11.94	10.80	12.32	12.25	-
Pre-Kind. Spring	12.03	13.00	12.77	12.74	-
Kindergarten	12.54	11.40	12.06	11.66	12.17
1st Grade	10.92	11.04	11.70	11.61	11.66
<u>Timidity</u>					
Pre-Kind. Fall	12.07	11.51	12.87	12.17	-
Pre-Kind. Spring	12.17	13.89	12.96	12.48	-
Kindergarten	12.25	12.76	13.03	11.97	11.62
1st Grade	11.82	12.55	12.16	13.17	12.86
<u>VSP</u>					
Pre-Kind. Fall	10.25	11.27	10.25	11.53	-
Pre-Kind. Spring	12.17	14.38	10.80	12.64	-
Kindergarten	11.03	12.42	12.35	12.17	11.33
1st Grade	11.98	11.91	10.77	11.53	12.07
<u>Aggression</u>					
Pre-Kind. Fall	13.31	12.70	12.77	13.20	-
Pre-Kind. Spring	13.86	13.06	12.93	12.11	-
Kindergarten	13.05	11.53	13.70	11.74	12.83
1st Grade	11.41	13.27	13.38	12.46	13.48
<u>Achievement</u>					
Pre-Kind. Fall	12.15	11.72	11.38	12.33	-
Pre-Kind. Spring	11.86	13.06	11.22	12.38	-
Kindergarten	11.98	12.10	12.64	11.97	12.50
1st Grade	11.03	11.57	11.35	12.46	12.45

TABLE 1 continued

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	B-E	DANCEE	Montessori	Traditional	Controls
Face Sheet Ratings PSI Testers					
<u>Factor I</u>					
Pre-Kind. Fall	2.74	2.84	2.98	2.68	2.81
Pre-Kind. Spring	2.37	2.50	2.87	2.71	2.83
Kindergarten	2.27	2.48	2.49	2.16	2.39
1st Grade	2.32	2.39	2.28	2.43	2.01
<u>Factor II</u>					
Pre-Kind. Fall	2.72	2.91	2.86	2.66	2.42
Pre-Kind. Spring	2.27	2.48	2.73	2.75	2.79
Kindergarten	2.24	2.50	2.37	2.21	2.37
1st Grade	2.42	2.48	2.34	2.46	2.37
<u>Factor III</u>					
Pre-Kind. Fall	2.62	2.87	2.75	2.43	2.39
Pre-Kind. Spring	2.21	2.37	2.55	2.59	2.59
Kindergarten	2.25	2.43	2.47	2.33	2.81
1st Grade	2.35	2.29	2.27	2.33	2.10

TABLE 2

Main Test Battery: Kindergarten and First Grade Means for Head Start and Control Children With Two Years of Follow Through or Two Years of Regular

	3-3 (N=9)		DARCEE (N=3)		Montessori (N=10)		Traditional (N=11)		Controls (N=13)	
	FF	HR	FF	PR	FF	HR	FF	HR	FF	HR
Stanford-Binet										
Kindergarten	100.56	93.54	89.25	98.48	91.20	96.27	97.54	95.78	95.53	94.90
1st Grade	95.22	90.87	85.87	97.51	90.50	95.94	90.45	95.47	92.69	94.35
Log and Bone										
Kindergarten	8.11	6.58	5.12	8.27	11.40	7.55	7.27	6.15	6.07	7.80
1st Grade	5.11	7.33	7.12	9.64	6.10	7.16	9.45	7.21	7.84	9.05
Replacement Puzzle A										
Kindergarten	24.00	23.79	23.12	24.00	22.90	23.83	24.00	23.05	23.23	24.00
1st Grade	23.65	23.91	24.00	23.57	22.30	22.88	23.72	23.35	22.69	23.65
Replacement Puzzle B										
Kindergarten	12.55	13.13	8.62	11.39	12.60	11.74	12.63	12.21	10.23	11.60
1st Grade	9.00	12.08	14.37	9.93	13.00	10.66	10.18	12.21	10.69	12.90
Curiosity- Verbal										
Kindergarten	1.44	.95	1.12	2.12	1.40	.22	1.45	.63	.69	.75
1st Grade	.77	.44	2.87	2.21	2.60	1.22	.90	.89	.61	.95

TABLE 2 continued

	B-E		DARCEE		Montessori		Traditional		Controls	
	FF	RR	FF	RR	FF	RR	FF	RR	FF	RR
<u>Curiosity-Activity</u>										
Kindergarten	20.22	15.08	15.75	17.09	15.30	19.22	14.63	9.57	13.46	16.00
1st Grade	19.44	19.83	20.87	17.75	14.30	13.11	16.27	13.57	16.76	17.05
<u>PSP</u>										
Kindergarten	115.88	99.13	98.00	101.27	102.22	108.55	100.27	100.35	109.92	98.30
1st Grade	120.44	122.00	115.00	119.21	120.11	121.38	120.27	121.42	120.30	121.95
<u>BCI</u>										
Kindergarten	24.55	32.33	41.00	31.60	32.10	31.44	36.09	35.47	42.23	35.40
1st Grade	20.77	30.75	31.62	26.39	27.00	27.05	25.00	28.89	30.46	27.65
<u>Behavior Inventory</u>										
<u>Independence</u>										
Kindergarten	14.22	11.63	11.12	11.06	12.50	12.27	11.80	10.88	11.69	11.80
1st Grade	11.77	10.81	10.75	11.00	11.80	11.83	12.10	12.15	12.30	11.75
<u>VSP</u>										
Kindergarten	13.55	10.90	12.25	12.09	12.00	12.83	13.10	10.88	12.00	11.20
1st Grade	11.55	12.00	10.75	12.36	11.40	10.50	10.30	12.22	11.15	12.05
<u>Aggression</u>										
Kindergarten	14.22	12.09	12.37	11.33	13.80	14.33	12.40	11.50	12.61	12.80
1st Grade	11.55	11.31	13.00	13.42	12.40	14.05	12.30	13.11	12.76	13.65

TABLE 2 continued

	D-E		PAROLE		Nonparole		Additional		Controls	
	FE	RR	FE	RR	FE	RR	FE	RR	FE	RR
<u>Monthly</u>										
Kindergarten	12.44	11.09	13.00	12.42	13.00	13.27	13.00	10.94	12.07	10.95
1st Grade	12.22	12.09	10.50	13.36	12.30	12.00	13.40	13.55	12.84	13.70
<u>Achievement</u>										
Kindergarten	13.88	11.45	12.25	12.00	12.30	13.11	12.50	11.16	11.00	12.25
1st Grade	11.34	11.31	9.75	12.06	9.70	12.61	12.50	13.50	11.61	13.00
<u>Free Sheet Ratings</u>										
<u>EST Testers</u>										
<u>Factor I</u>										
Kindergarten	1.86	2.32	2.47	2.40	2.18	2.65	1.93	2.36	2.97	2.10
1st Grade	1.66	2.28	2.59	2.24	2.37	2.34	2.12	2.56	2.52	1.91
<u>Factor II</u>										
Kindergarten	1.88	2.31	2.63	2.44	2.22	2.40	1.93	2.39	2.82	2.19
1st Grade	1.46	2.37	2.46	2.34	2.15	2.59	1.90	2.73	2.60	2.39
<u>Factor III</u>										
Kindergarten	1.67	2.27	2.41	2.41	2.46	2.46	2.14	2.45	2.86	2.27
1st Grade	1.61	2.29	2.44	2.20	2.17	2.40	1.65	2.70	2.67	2.15
<u>C-B Testers</u>										
<u>Factor I</u>										
Kindergarten	2.25	2.36	2.83	2.21	2.70	2.46	2.69	2.47	2.54	2.20
1st Grade	2.73	2.47	2.58	2.39	3.03	2.33	3.03	2.41	2.73	2.37

TABLE 2 continued

	B-S		DARCEE		Montessori		Traditional		Controls	
	<u>FF</u>	<u>RR</u>	<u>FF</u>	<u>RR</u>	<u>FF</u>	<u>RR</u>	<u>FF</u>	<u>RR</u>	<u>FF</u>	<u>RR</u>
<u>Factor II</u>										
Kindergarten	1.70	2.45	2.57	2.11	2.55	2.39	2.30	2.29	2.51	2.25
1st Grade	2.70	2.60	2.60	2.31	2.82	2.20	2.91	2.61	2.46	2.45
<u>Factor III</u>										
Kindergarten	1.93	2.44	2.84	2.06	2.64	2.45	2.43	2.41	2.47	2.21
1st Grade	2.58	2.34	2.40	2.31	3.00	2.25	2.77	2.65	2.75	2.43

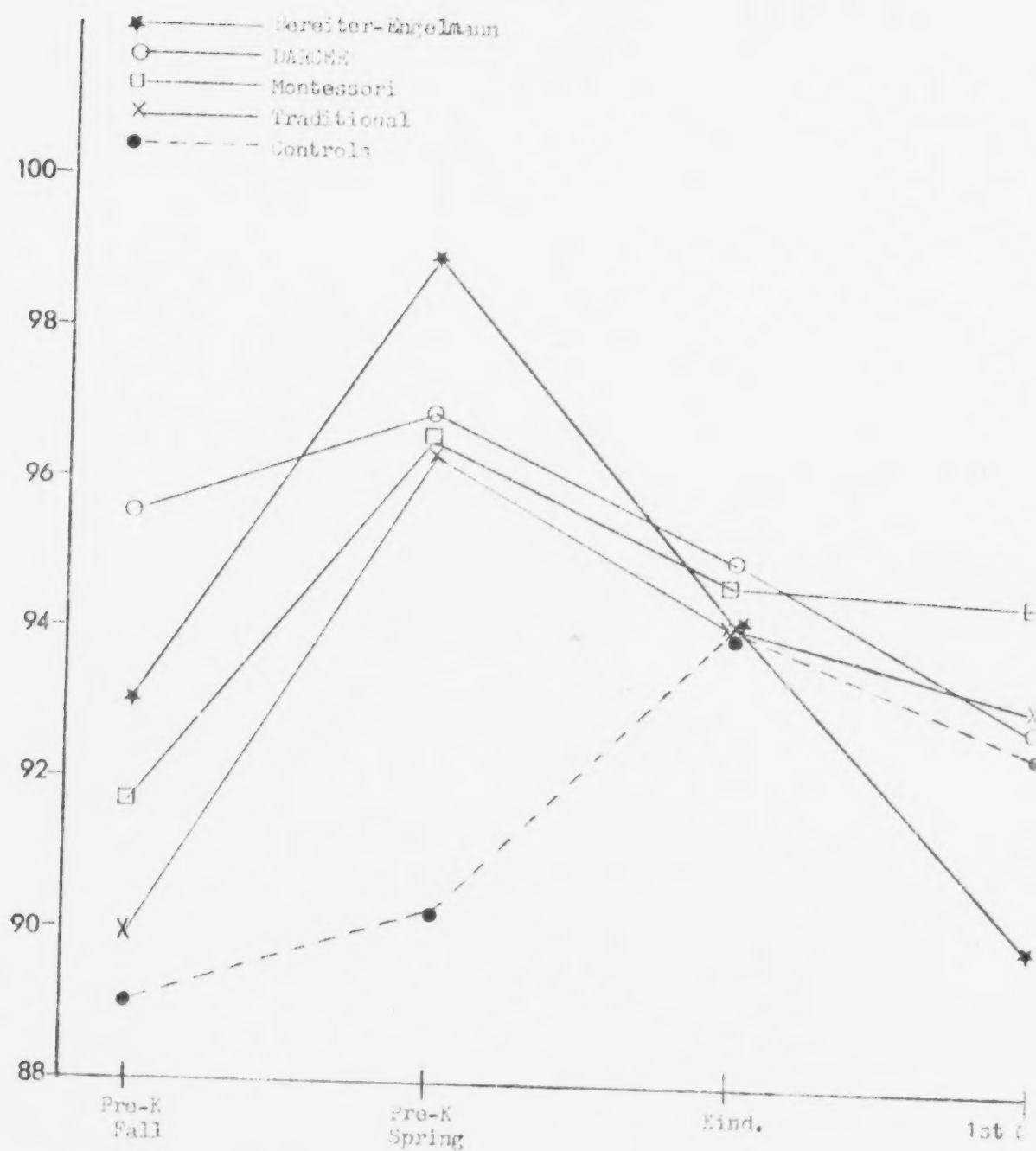


Fig. 1. Stanford-Binet: Pre-Kindergarten, Kindergarten, and 1st Grade means for Head Start programs and original controls.

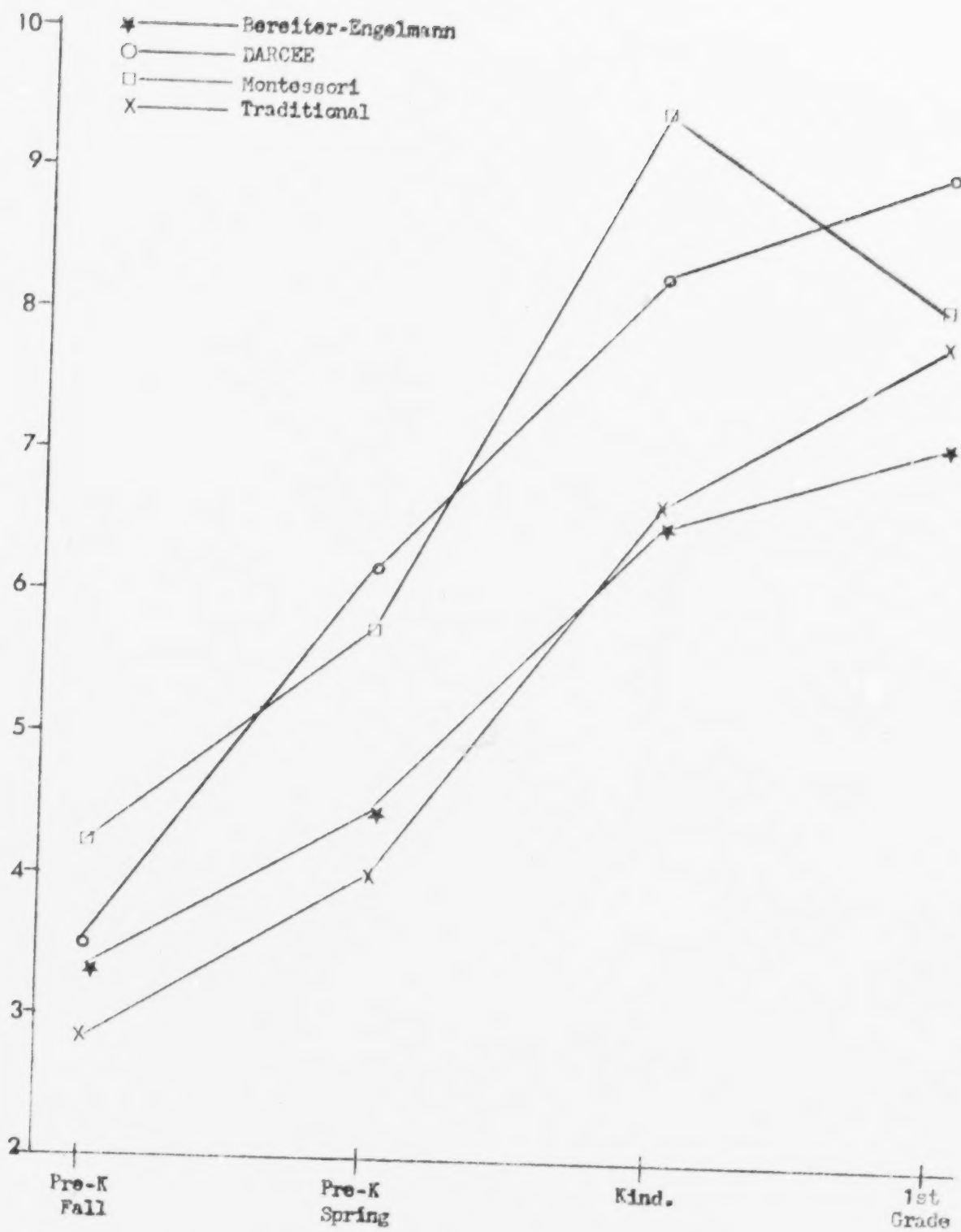


Fig. 2. Dog and Bone: Pre-Kindergarten, Kindergarten, and 1st Grade means for Head Start programs.

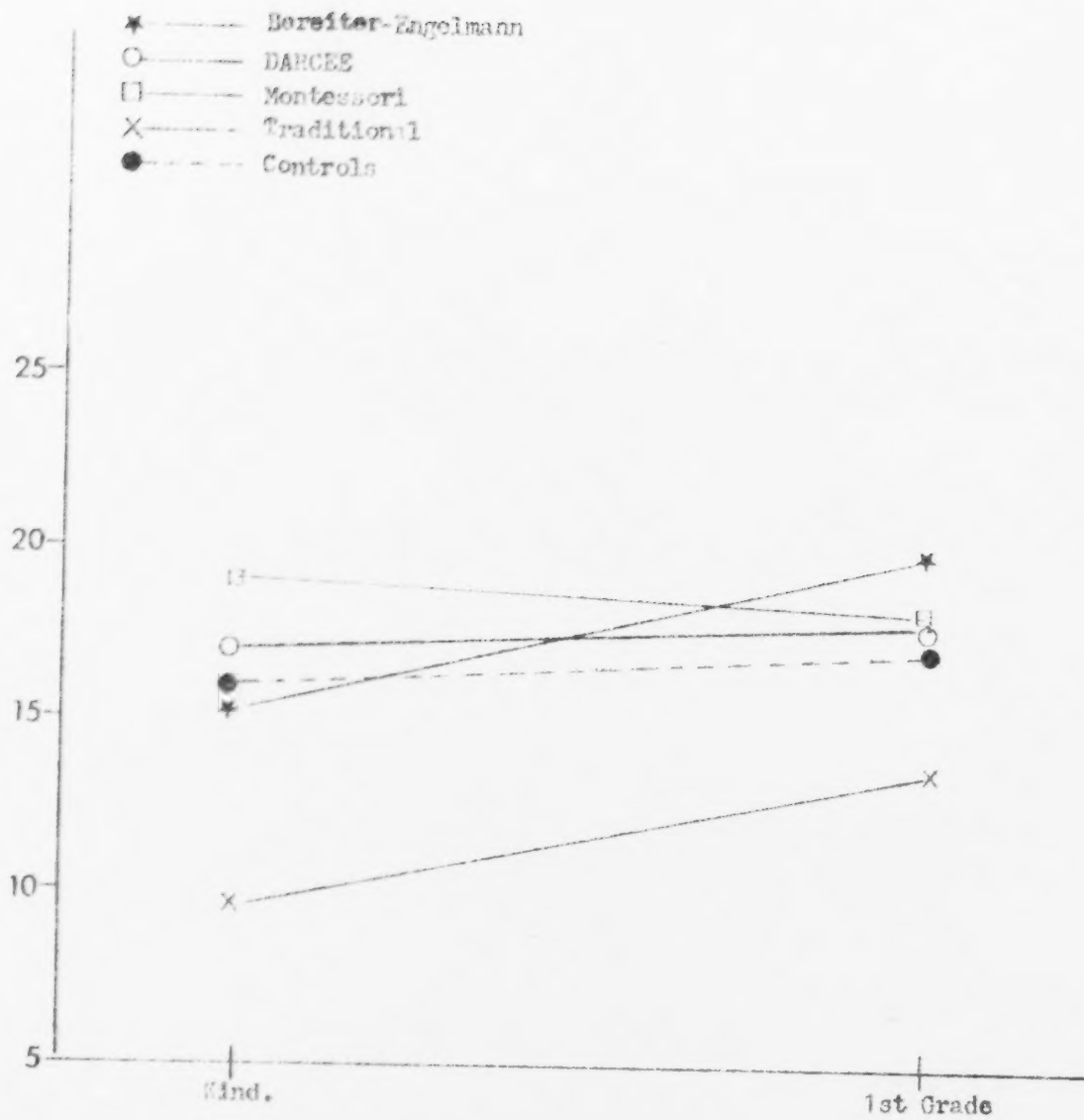


Fig. 3. Curiosity-Activity: Kindergarten and 1st Grade means for programs and controls within all sequence.

Controls at that point. DARCEE, Traditional, and Controls improved greatly from kindergarten to first grade, becoming less aggressive. Traditional and Controls became less timid from kindergarten to first grade; Montessori children became more timid. In Achievement Motivation, B-E, DARCEE, and Montessori all decreased; Traditional and Controls increased.

(2) FF-RR Effects

The decrease in IQ over all Head Start programs was slightly greater in FF than in RR, as shown in Figure 4. On the BCI, however, improvement was greater in FF than in RR despite the high correlation between these two measures. On the Behavior Inventory, for all factors except Independence, there was a FF-RR x Time interaction--FF teachers rated children higher than RR teachers did in kindergarten, but in first grade, RR children were rated higher.

(3) Sex Differences

On the Stanford-Binet, both sexes showed similar gains in the Head Start year, and although both decreased in kindergarten and first grade, the girls' decrement was greater than the boys' (6 points vs. 1.5 points). At the end of first grade, the females' mean was lower than at the beginning of Head Start (not significant), while the mean for males was higher than it was at the beginning (Figure 5). Over all four data points, males were higher than females on Curiosity-Activity. Males were also significantly higher at the end of first grade. On two other measures males were higher than females at the end of first grade--Achievement Motivation and Independence. Females were superior on the Wepman Auditory Discrimination Test, and within DARCEE and Controls, females were higher on Parallel Sentence Production. In all other groups, there was no sex difference on this measure.

Analyses - (Achievement)

A single analysis which included Head Start program, Follow Through vs. Regular, and sex would have involved very small sub-groups. Therefore, two analyses of variance were made on raw scores on the California Achievement Test at the end of first grade.

One analysis was a 5 x 2 made on the original groups (the four Head Start programs and CL₁) by sex. N was 197.

To compare Regular and Follow Through, a 2 x 2 analysis of variance of raw scores was made, including the sex variable but combining experimental Head Start programs and control groups. N was 188.

Head Start program and sex were of particular interest in these analyses. It was also considered important to examine the effects of intervention on achievement in comparison with national norms.

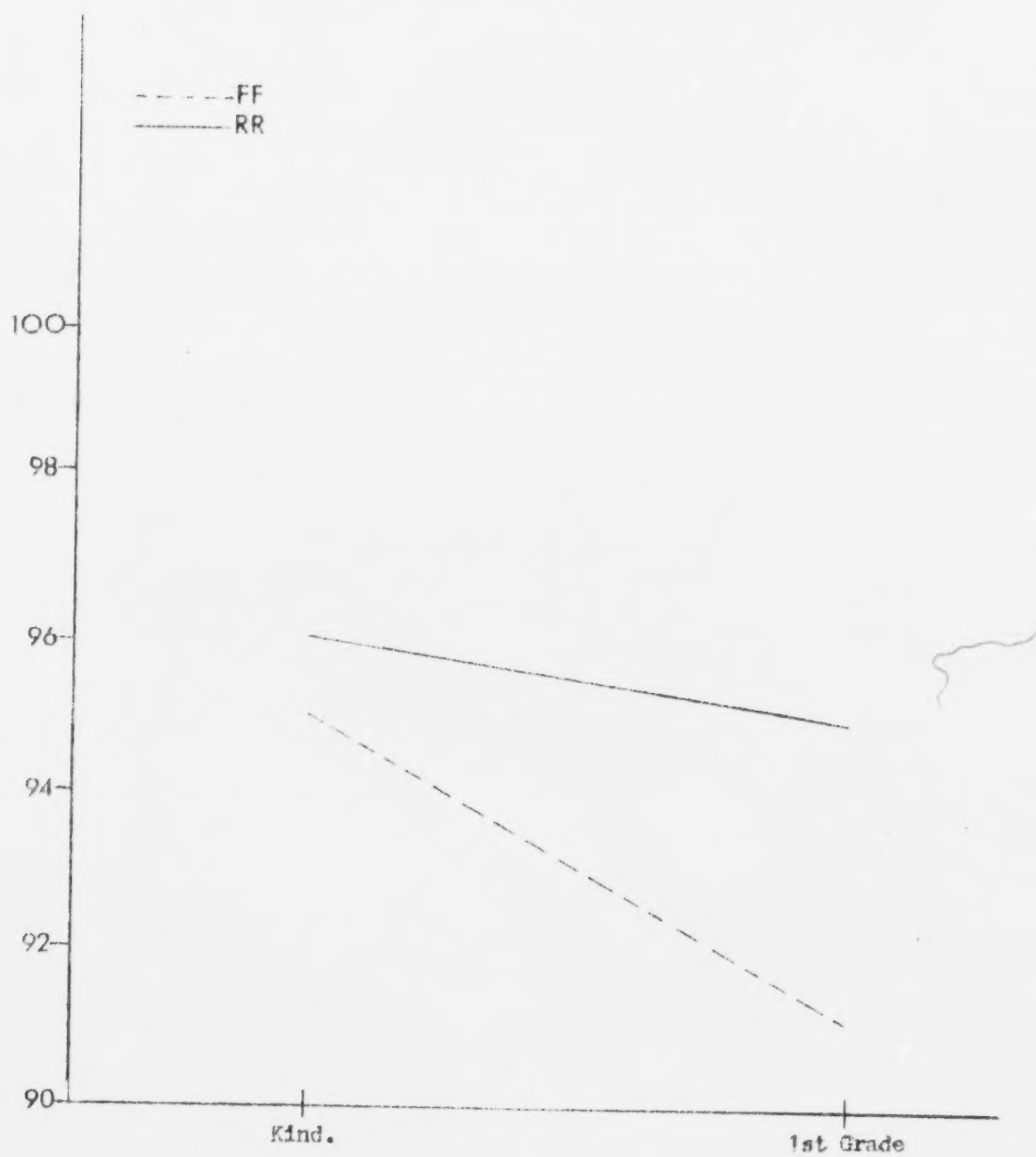


Fig. 4. Stanford-Binet: Kindergarten and 1st Grade Means for FF and RR.

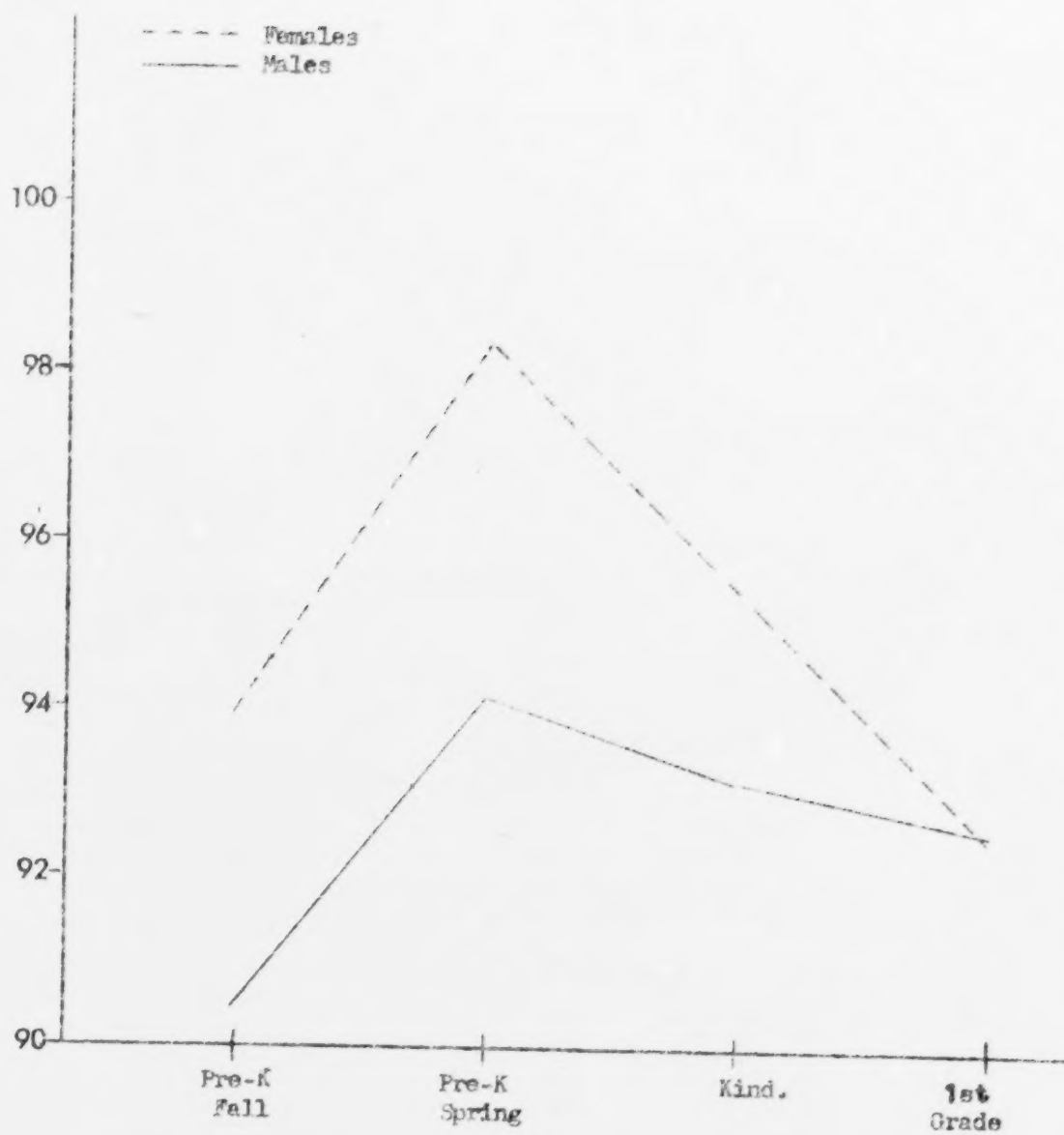


Fig. 5 Stanford-Binet: Prekindergarten, Kindergarten, and 1st Grade means for males and females.

Did these Head Start programs as a whole or did any particular one of them provide the children with an important advantage in terms of their national standing on achievement-type tests? Of particular interest also was the pattern of effects over time. Were the advantages at one point in time later dissipated, maintained, or augmented? Were there delayed effects on achievement?

Although the first-grade score was the only one available on the California Achievement Test, other achievement-type tests had been previously given the same children at three different times. At the end of prekindergarten and kindergarten, the Preschool Inventory was given. At the beginning of first grade, after a year of kindergarten, the Metropolitan Readiness Test was given.

In order to use these three different tests in a repeated measures analysis, the following procedures were adopted. Individual scores on Reading and Math on the California Achievement Test were transformed to percentiles based on the national norms. The mean of these two percentiles was used to provide a composite achievement score. Scores for these same groups of children on the Metropolitan Readiness Test given at the first of the year in first grade, and the Preschool Inventory (PSI)¹ given at the end of Head Start and end of kindergarten, were also converted to percentiles. PSI percentiles at the end of Head Start were used to determine whether the groups differed prior to kindergarten. This was possible for all groups except CL₂ on whom no Head Start scores were available. No significant differences were found at the end of Head Start. Two repeated measures analyses of variance were then made on these percentiles over three time periods--end of kindergarten (PSI), beginning of first grade (Metropolitan Readiness Test), and end of first grade (California Achievement Test).

In the first analysis the two sexes and the four types of Head Start were combined for a $2 \times 2 \times 3$ analysis of variance--FF vs. RR, Head Start vs. Controls, and Time. N was 151. A second repeated measures analysis of percentiles on achievement measures was performed on scores of the RR group only. This was a $5 \times 2 \times 3$ analysis, including type of Head Start program plus Controls, sex, and the three time periods. N for this analysis was 106.

Finally, in order to obtain a more precise answer to the question of the effects of these Head Start programs, it was desirable to make a comparison between the experimental sample and the population of children from which the sample was drawn. For this purpose, scores on California Achievement were obtained from the schools on all children in the city who took the test in the spring of 1971 at the end of their first-grade year. Since not all of the individual scores have become available yet, analyses have not been completed. Summary

¹ PSI percentiles were obtained from Educational Testing Service and were based on data obtained from 438 children. These norms were made available to us in 1969.

data in terms of grade equivalents are presented for examination and discussion.

Results

(1) First-Grade Achievement (Raw Scores)

Table 3 presents the raw score means for the two first-grade programs (Follow Through and Regular) by sex for the California Achievement Test at the end of first grade. In Table 4 are presented the raw score means by Head Start program by sex. At the first-grade point there were no main effects for either Head Start program or Follow Through-Regular. Comparing Follow Through and Regular first grade only, there was a sex-by-first-grade program interaction in Math Computation and Math total. Males were superior in Follow Through and there was no difference between the sexes in Regular. This interaction is shown in Figure 6. Combining Head Start programs over both types of first grade, there was a sex main effect on Reading Vocabulary. However, this appeared to be due primarily to a large discrepancy in favor of Control females in the Regular sequence (CL₁).

(2) Head Start Programs - National Norms

Table 5 presents the mean percentiles, grade equivalents, and IQs for Head Start and FF-RR combinations.² The means for the four programs in RR on PSI at the end of Head Start did not differ.

An interaction of Head Start program-by-Time occurred, indicating a significant change in relative standing among the five groups within the Regular sequence. As shown in Figure 7, at the end of first grade, groups from Traditional, Montessori, and DARCEE Head Start were very similar (above the national mean) in achievement, and the Bereiter-Engelmann and Control groups were much lower. Reference to Table 5 indicates that although they were superior to Controls in Reading, B-E children appeared especially handicapped in Math, scoring at the 31st percentile and below Controls, who were at the 44th percentile. The difference between these two groups in terms of expected grade level was four months. The difference between the highest groups and B-E was six months.

Of particular interest is the comparison of Traditional and Controls who were at the same percentile on PSI at the end of Head Start and very close on Metropolitan Readiness at the

² Since separate Reading and Math scores were not analyzed, percentiles and grade equivalents based on individual scores were not available. Therefore, percentiles based on group means are presented for all tests in tables and graphs for discussion purposes.

TABLE 3
 California Achievement Test: 1st Grade Means for Males and Females
 in Follow Through and Regular

	Follow Through		Regular		All Groups	
<u>Reading</u>						
Males	N 26	73.92	N 66	70.35	N 92	71.36
Females	24	70.42	72	76.97	96	75.33
Total	50	72.24	138	73.80		
<u>Math</u>						
Males	26	60.73	66	51.45	92	54.08
Females	24	48.92	72	53.31	96	52.21
Total	50	55.06	138	52.42		

TABLE 4

California Achievement Test: 1st Grade Means for Males and Females
Head Start Programs and Controls (CL₁)

	B-E	DARCEE	Montessori	Traditional	Controls
<u>Reading</u>					
Males	71.10	69.50	75.12	80.00	53.38
Females	76.67	73.50	74.31	77.00	73.14
Total	74.14	71.28	74.77	78.17	63.63
<u>Math</u>					
Males	50.90	49.93	55.47	60.36	45.08
Females	48.17	52.75	52.46	54.00	54.00
Total	49.26	51.18	54.17	56.47	49.70

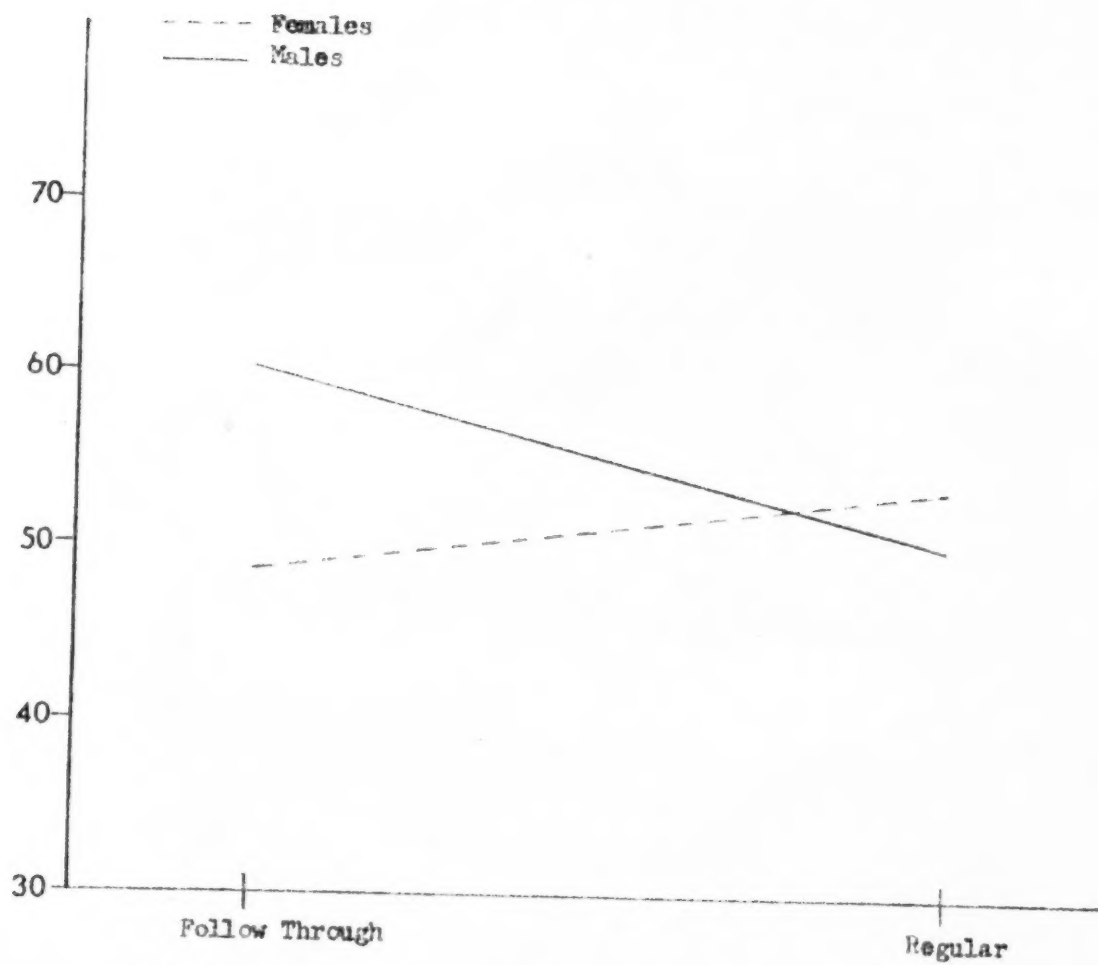


Fig. 6. California Achievement Test-Math: Means for males and females in Follow Through and Regular.

TABLE 5

Preschool Inventory, Stanford-Binet, Metropolitan Readiness Test, and
California Achievement Test: Mean Percentiles, Grade Equivalents, and
I.Q.s for Head Start and FF-RR Combinations

		Pre-Kind.	Kindergarten		1st Grade					
		PSI	PSI	S-B	Metro	California				S-B
						Reading		Math		
B-E	N	%	%	Mean	%	%	G.E.	%	G.E.	Mean
FF	9	85	86	100.66	71	57	1.8	58	1.9	95.22
RR	20	63	64	93.54	16	49	1.7	31	1.2	90.87
<u>DARCEE</u>										
FF	8	63	71	39.25	55	43	1.5	41	1.5	85.87
RR	32	73	76	98.48	31	62	1.9	53	1.8	97.51
<u>Montessori</u>										
FF	10	37	64	91.20	44	35	1.2	45	1.6	90.50
RR	17	71	79	96.27	36	63	1.9	58	1.9	95.94
<u>Traditional</u>										
FF	7	54	76	97.54	79	63	1.9	73	2.2	90.45
RR	17	57	58	95.78	29	62	1.9	55	1.8	95.47
<u>All Head Start</u>										
FF	47	54	76	94.71	61	49	1.7	55	1.8	90.79
RR	106	67	66	96.36	27	59	1.8	50	1.7	95.25
<u>Controls</u>										
FF	13	-	55	95.53	69	50	1.7	65	2.0	92.69
RR	20	57	66	94.90	25	27	1.0	44	1.6	94.35

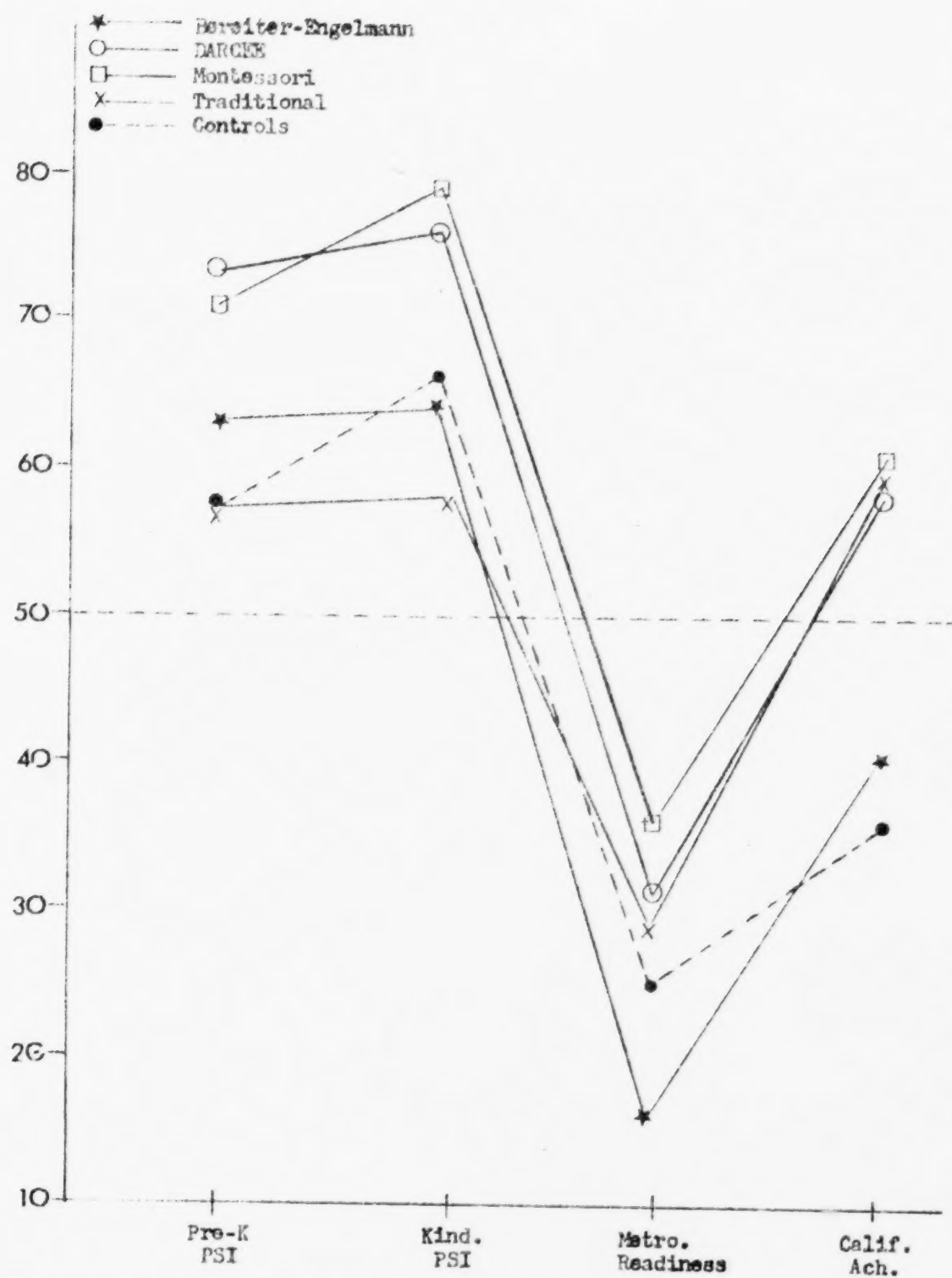


Fig. 7. Preschool Inventory, Metropolitan Readiness Test, and California Achievement Test: Percentiles for Head Start programs and controls within RR.

beginning of first grade, but differed greatly at the end of first grade. The difference in Reading was nine months (Table 5).

Since Follow Through was a highly specialized and more homogeneous program than Regular in both kindergarten and first grade, it might be expected to interact more strongly than the Regular sequence with prekindergarten programs. The data from this study did not permit an adequate test of this hypothesis but Figure 8 shows that Traditional, which was very low on PSI after Head Start, was the highest group on achievement at the end of first grade, and Bereiter-Engelmann, which ended Head Start extremely high, did not maintain this position.

(3) FF-RR Effects - National Norms

In terms of national percentiles, there was no evidence of overall superiority at first grade for Follow Through children from experimental Head Start programs. FF were slightly higher in Math but slightly lower in Reading. This is in contrast to the picture at the end of kindergarten on the Metropolitan Readiness Test, where there was a clear and substantial Follow Through superiority.

The separation between the two control groups who entered kindergarten without any Head Start, however, appeared quite substantial. These two groups did not differ on PSI at the end of kindergarten nor did they differ in IQ at that time nor at the end of first grade. (PSI at the end of Head Start was not available for Follow Through Controls.) But those who had two years of Follow Through were the highest of the four groups in Math achievement while those who had Regular Kindergarten and First Grade were the lowest. Controls in Regular were particularly low in Reading achievement and far below children in Regular who had had Head Start (Table 5).

A three-way interaction of FF-RR-by-Head Start-by-Time occurred. This is shown in Figure 9. Although this interaction does not unambiguously confirm the hypothesis that FF had a greater effect on Controls than on experimentals, the result is consistent with this hypothesis.

(4) Head Start Effects - Local Population

Available summary data in grade equivalents as shown in Table 6 suggest that the children from these experimental Head Start programs were superior by five months to the average Reading achievement level in comparable (Title I) schools and superior by two months to the entire city, which includes some middle-class schools. It should be noted that both the city and Title I medians include data from experimental Ss. Therefore, the experimental advantage may be underestimated. As shown also

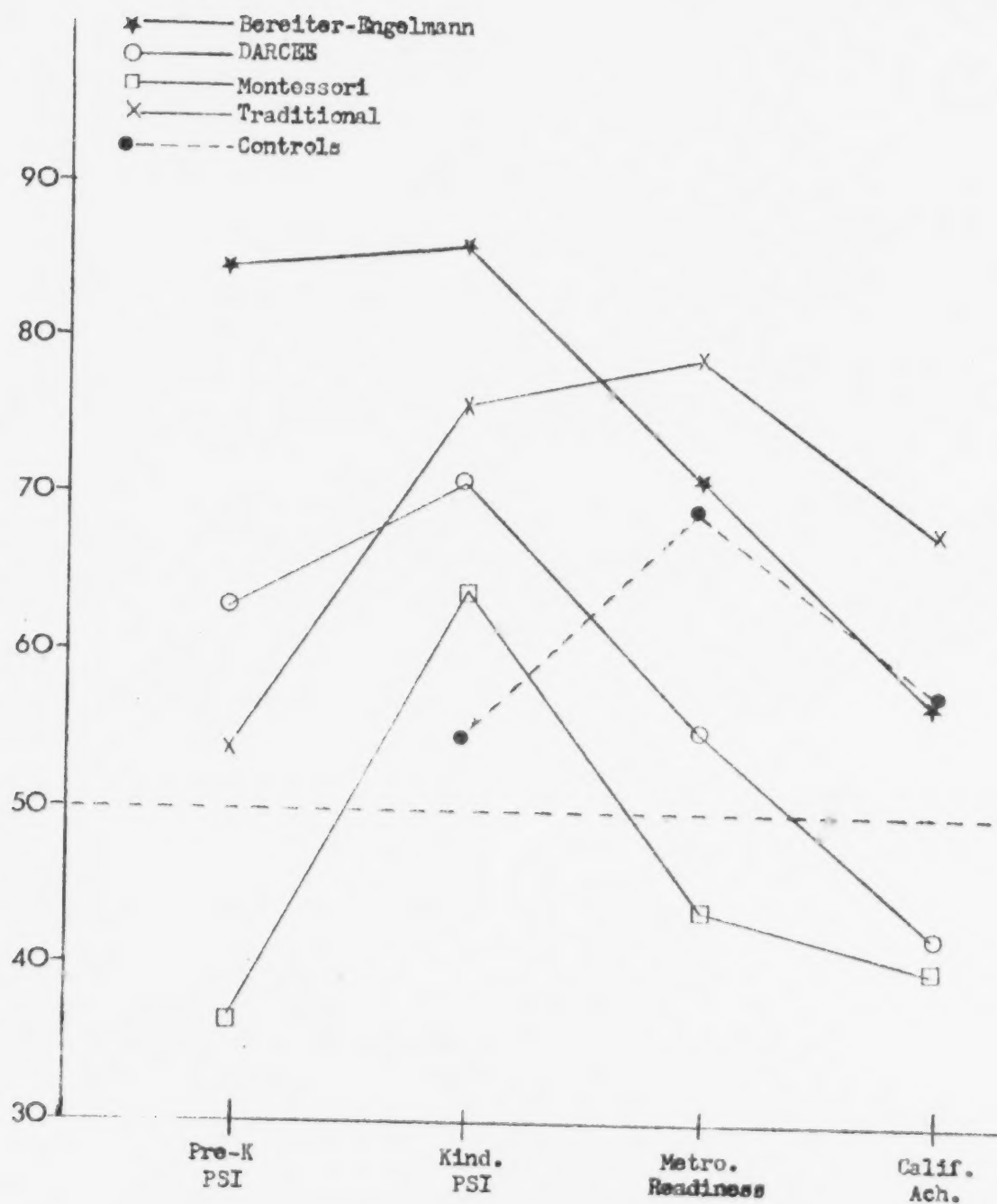


Fig. 8. Preschool Inventory, Metropolitan Readiness Test, and California Achievement Test: Percentiles for Head Start programs and controls within FF.

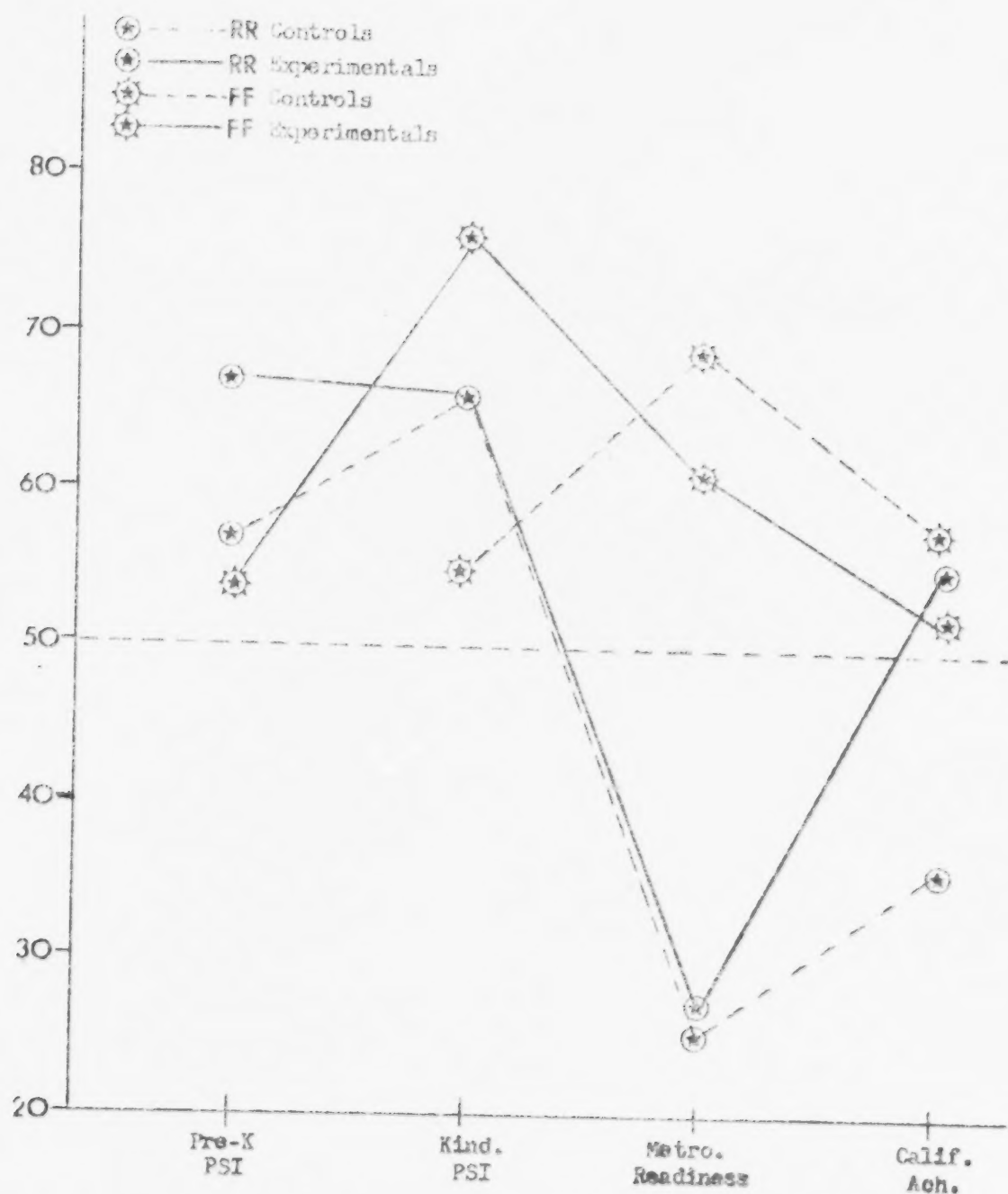


Fig. 9. Preschool Inventory, Metropolitan Readiness Test, and California Achievement Test: Percentiles for FF-HQ/Head Start-no Head Start combinations.

TABLE 6
Grade Equivalents on First Grade California Achievement Test
Experimental Samples Compared to Populations

	Reading	Math
All City Schools	1.5	1.7
Title I Schools	1.2	1.5
All Follow Through	1.5	2.0
Experimental Head Start	1.7	1.7
	(FF 1.7)	(1.8)
	(RR 1.8)	(1.7)
National Mean	1.7	1.7

Note:- GE based on school medians for City and Title I, on child median for all Follow Through, and on child mean for experimental Head Start and FF-RR.

From top to bottom on the table, each group is contained in the preceding group except for RR. Experimental Head Start and FF-RR exclude controls.

in Table 6, the position of the experimental Head Start groups was not simply due to the scores of those who had FF, since these children and those who had RR were very similar. Comparing the entire group who had Follow Through with those in experimental Head Start who entered Follow Through (FF), it is clear that experimental Head Start provided a Reading advantage of two months. The entire Follow Through group included those who had the experimental Head Starts. Therefore, this difference also may be underestimated. In Math, the experimental Head Starts were even with the city median but it appears that the greatest advantage in this area was held by the Follow Through group as a whole.

Further analyses involving separation of various sub-sets from remaining populations and based entirely on children's raw scores should provide a more accurate picture of these results. A substantial change in relative positions would not be expected, however.

Summary of Results by Groups

The prekindergarten B-E program across both kinds of kindergarten and first grade appeared to result in low scores on Inventiveness, increased Aggression, greater Timidity, and a decrease in Achievement Motivation. B-E children's IQs appeared to decline somewhat more than those of children from other prekindergarten programs, particularly when they entered the Regular educational sequence. In first grade, B-E children who had RR were significantly low in achievement, especially Math.

The DARCEE prekindergarten program produced high scores on Inventiveness--the children continued to increase in kindergarten and first grade and were the highest group at the end of first grade. They became significantly less aggressive from kindergarten to first grade, but decreased in achievement motivation--primarily in FF. Within the Regular sequence, they were exceptionally high on Curiosity-Verbal, and they increased greatly on this measure in FF as well, becoming the highest group. They were above national norms in California Achievement at first grade.

The Montessori prekindergarten group declined in Inventiveness from kindergarten to first grade and became more aggressive. Within the Regular sequence, however, this group remained the least aggressive, though not significantly so. They shifted from least to most timid in this period also, and decreased in achievement motivation. They were above national norms in California Achievement.

Traditional children increased in Inventiveness but were still comparatively low at the end of first grade. They became less timid from kindergarten to first grade. In this period, they also increased in achievement motivation by teachers' ratings. They were significantly low on Curiosity-Activity at the end of the

first grade. In achievement, the Traditional children scored as well as DARCEE and Montessori within the Regular program and in FF they were the highest group.

Controls without prekindergarten (CL₁) did not change in IQ during the prekindergarten year, whereas Head Start children increased. During the kindergarten year, Controls increased; Head Start children decreased. Controls also improved in Inventiveness from kindergarten to first grade and in the Regular program were close to DARCEE children on this measure. They became much less aggressive from kindergarten to first grade and less timid. They increased in achievement motivation but this appeared to have been the case primarily in the Regular sequence. California Achievement scores appeared to differ as a function of type of kindergarten and first grade, with Controls in FF being much higher.

There were not many FF-RR differences. Decline in IQ was slightly accelerated in FF but improvement on the Basic Concept Inventory was greater. On all Behavior Inventory measures, children were rated higher in kindergarten by FF teachers but higher by Regular teachers in first grade. In California Achievement, FF was not significantly better than RR at first grade, except that two years of Follow Through appeared to benefit Controls without Head Start. FF Controls and RR Controls did not differ on PSI achievement at the end of kindergarten, but at the end of first grade, FF Controls had a mean national percentile for achievement of 67.5, while RR Controls scored at the 45.5 percentile.

Sex differences also occurred. There were similar gains in IQ during prekindergarten for the sexes, but girls declined from that point to end of first grade more than boys did. At the end of first grade, females were higher than males on the Wepman Auditory Discrimination Test and lower on Curiosity-Activity. Males were higher on teachers' ratings of Achievement and Independence. Control females (CL₁) were higher in Reading Vocabulary. On Math, males were superior in FF, but there was no difference in Regular.

Overall Summary

Head Start program differences on Binet IQ obtained in the prekindergarten year had disappeared by the end of first grade, following a gradual but steady decline for all groups. The B-E group declined somewhat more than others and decline was greater in FF than in RR. Controls increased in IQ during kindergarten and first grade. In school achievement, however, the picture was different. Within the RR sequence, all Head Start groups were above national norms on California Achievement Test except Controls and B-E. Regardless of the FF-RR sequences, experimental Head Starts were equal to the city median and superior to similar (Title I) schools.

Stable Head Start program effects were found over the three years on Inventiveness (Dog and Bone) with DARCEE and Montessori high and B-E and Traditional low. Traditional remained low on Curiosity-Activity. B-E children became more aggressive through kindergarten and first grade.

Stable sex effects were found in favor of males on Curiosity-Activity, Achievement Motivation, and Independence. Females were at first higher in IQ but declined to a mean slightly below their initial point whereas the mean IQ for males at the end of first grade was above the prekindergarten level. For the second time females were found to be higher on Parallel Sentence Production in the DARCEE program.

Discussion

There can be little doubt that in general children from these experimental Head Start programs were performing better academically at the end of first grade than their counterparts in disadvantaged (Title I) areas of the city. Since there were 34 other Head Start classes during the year of the experiment, many of these children in the Title I schools did have the regular prekindergarten program.

Comparing Controls who had no prekindergarten with those who had the experimental Head Starts confirms that the experimental Head Starts were quite valuable for children who were destined for Regular programs in kindergarten and first grade.

Comparison in terms of national norms indicates that three of the experimental Head Start programs given in prekindergarten (DARCEE, Traditional, and Montessori) had effects which were not strongly manifest on the Readiness Test at the end of kindergarten but did appear on first-grade achievement. If the position of the B-E group in the RR sequence represents a real program effect, one might speculate that they were handicapped during kindergarten and did not catch up during the first-grade year. It is interesting that B-E children were considerably higher than Controls in Reading whereas in Math they were the lowest group at the 31st percentile. Since teaching of arithmetic occupies one-third of the time given to academic study in the B-E program, this result may reflect a confusion on the part of the children resulting from a difference in method. The Math program in B-E is a very specialized approach. Even the Reading scores of the B-E group, however, would be expected to be higher on the basis of their Head Start achievement. Therefore, it appears possible that the introduction of the B-E program as implemented in this experiment at the four-year-old level was in some way detrimental, given the available sequences. This result, of course, says nothing about the value of B-E when introduced at the kindergarten level. Nor, in fact, can effects of the other programs be generalized over other age levels.

Attention should be called to results from the Traditional Head Start. Both Follow Through and Regular groups from this prekindergarten

garten program began kindergarten with a disadvantage in terms of end-of-Head Start PSI scores. Yet this group finished first grade with achievement scores higher than all other groups and well above the national average. Whether this Traditional program was representative of the population of such classes cannot be determined. This appears doubtful since the four teachers had eight weeks of special training prior to the experiment and were part of the experiment rather than a control group. The results do suggest that a Traditional program can provide prekindergarten experiences that are at least as good as those of the other three if first-grade achievement is used as a criterion.

The dramatic Follow Through superiority measured by the Metropolitan Readiness Test at the beginning of first grade was no longer found on California Achievement at the end of the year. This result may reflect the greater difference between the Regular and Follow Through Kindergartens than between the two first-grade programs in terms of academic content. Regular Kindergarten was quite similar to Traditional Head Start and very different from Follow Through Kindergarten; Regular First Grade was, of course, a much more academic program and not so different in content from Follow Through First Grade. It appears that Follow Through was valuable for Controls who did not have the experimental prekindergartens and for B-E children but perhaps unnecessary for those who had the other three programs in Head Start.

From the results on the main battery, it is clear that raising IQs in the prekindergarten year is not a simple solution to higher academic achievement at a later period. Controls without Head Start increased in IQ over the years to the level of experimentals but were still well below national norms in achievement.

Significant results in areas other than achievement are theoretically exciting, but their practical implications are difficult to evaluate because satisfactory criteria are lacking. For example, no norms are available on the Dog and Bone or Curiosity Box. Are relatively low Inventiveness or Curiosity-Activity undesirable program effects? In the typical school situation which requires the "right" answer arrived at in the "right" way, divergent thinking or the ability to derive alternative solutions to problems, is probably not much of an asset. Nor do we know at this time whether exploration of the environment as measured by the Curiosity Box is related to intellectual curiosity and possibly therefore to cognitive development.

In any case it would seem that prekindergarten programs may have effects on motivations and attitudes which endure through two succeeding years, despite the vicissitudes of life and subsequent school experience. This fact should not be overlooked in efforts to accelerate achievement.

One very important cautionary note should be added: There is no evidence available from this study regarding the possible effects of

continuity in any of the four programs--i.e., a sequence consisting of the same type of program continued from prekindergarten through first grade. This is underscored by the sex differences found. While not consistent enough to allow firm conclusions, the variations in program effects as a function of sex of child may well be related to timing of programs or program components. If programs introduce experiences which are premature for certain groups, e.g., males, the effects of shifting to different programs subsequently may be detrimental for this reason alone.

Finally, it should be re-emphasized that the sources of program effects must be sought in program components or dimensions. Although both program dimensions and program effects have been assessed in this study, further experimental work will be necessary to establish causal relationships between them.